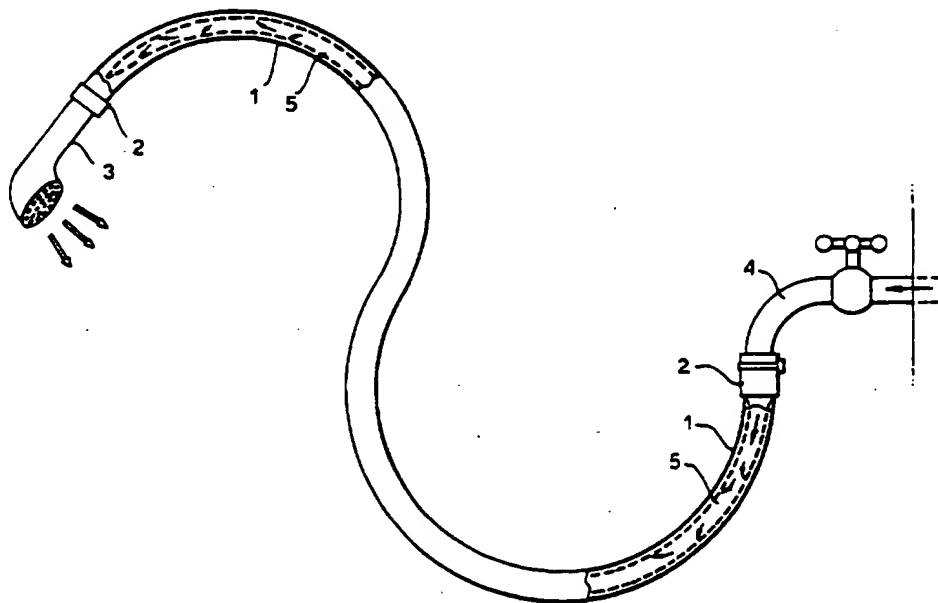




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/FI96/00063 <b>(22) International Filing Date:</b> 31 January 1996 (31.01.96) <b>(30) Priority Data:</b> 950442 1 February 1995 (01.02.95) FI <b>(71) Applicant (for all designated States except US):</b> OY SNE ENVIRONMENT ENGINEERING LTD. [FI/FI]; PL 137, FIN-60101 Seinäjoki (FI). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> RAJALA, Hannes [FI/FI]; PL 137, FIN-60101 Seinäjoki (FI). <b>(74) Agent:</b> RUSKA & CO. OY; Runeberginkatu 5, FIN-00100 Helsinki (FI).	<b>(81) Designated States:</b> AL, AM, AT, AT (Utility model), AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Finnish).</i>	

**(54) Title:** FILTER DEVICE**(57) Abstract**

A filter means comprising a water line and a filter member (5) which is fitted into a housing (3 or 1) and which alone or together with the housing (3 or 1) forms an elongated space which is open at its one end and closed at its other end and into which water is conducted through its open end. The filter member is fitted into a shower fixture formed by a hose (1) and a shower nozzle (3).

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## FILTER DEVICE

5 This invention concerns a filter means comprising a water line and a filter member which is fitted into a housing and which alone or together with the housing forms an elongated space which is open at one end and closed at the other end and to which water is conducted through its open end.

10 It is known to use activated carbon in filters. Such different active carbon filters intended for use in households are also known which can be connected to the end of the outlet pipe of a water tap to filter drinking water and to improve the water quality.

15 It is also known to use in the pipe a conical sieve narrowing in the direction of flow to separate solids from the liquid flowing in the pipe. Conical filters are also known.

20 It has been found that it would in some situations be very important to clean not only drinking water but also water used for washing. For example, publication WO 91/17810 describes a solution where a replaceable filter part is connected to a shower line. Water line connections are mounted in a cabinet mounted fixedly to the wall, and there are corresponding connections at the other end of the filter part. Thus, also the filter part may be located in a compartment in the cabinet. The installation is fixed and the filter part is of a rigid construction.

25 In earlier known solutions the surface area of the filter part is relatively small, so that water flows through it at a high speed, which results in a big pressure loss. Spraying of water, however, requires pressure. Another problem with a rigid filter is that contaminants may settle and adhere to piping walls and the filters can also easily be clogged. Short flows or dense "petrified" places generally tend to appear in the filter.

30 A filter in accordance with the present invention is characterized in that the filter member is fitted into a shower fixture formed by a hose and a shower nozzle. Preferably, the filter member is fitted into the flexible part of the shower fixture and it can be bent together with this.

35 The filter means in accordance with the invention can be connected to any water tap by means of a rapid connector. It

may be transported, for example, together with luggage, so that it can be used in hotels for filtering both washing water and drinking water. There are places having only a water tap and no shower, whereby with the means in accordance with the invention a hand shower is obtained along with filtration.

With the filter member fitted into a long hose it obtains a large surface area and a small thickness. Even if the filter mass thickness is relatively small, the necessary filter mass volume is achieved due to the large surface area. The water flowing velocity is low through the long and thin filter member radially outwards, whereby pressure losses are also low and the shower water is brought out under a pressure. Due to the low flowing velocity, dirt particles are also caught more efficiently in the filter device. Nor does the filter member require any additional space, as it is fitted inside the water fixture itself.

When the filter hose bends, contaminants possibly passing through the filter do not so much get caught between the hose and the filter in the narrow canal in the forward end, on the outlet side of the filter, but they will rather gather in the tail end of the filter device, on the inlet side of the filter. When the filter device in accordance with the invention bends with the hose, homogenizing shearing forces are created in the filter mass. These prevent the formation of dense petrifications and agitate sorted spots in the mass, thus preventing short flows from occurring.

A similar homogenization phenomenon occurs in the mass when the filter member extends under pressure, whereas it contracts when at rest and when drying.

Because the filter mass remains homogenous it adds to the efficiency and life of the filter member. Besides, when the hose is bent, contamination particles get mixed deeper into the filter mass.

The invention and its details are described more closely in the following, referring to the enclosed drawings, wherein

Figure 1 is a schematic view of a filter means in accordance with the invention, with the hose part cut at its forward end and tail end;

Figure 2 is a lengthwise section of the hose part on a larger scale, and Figure 2a is a cross-section;

Figure 3 is a lengthwise section of another alternative hose part;

5        Figure 4 is a lengthwise section of a third alternative hose part and Figure 4a is a cross-section of the same;

Figure 5 is a lengthwise section of yet another alternative hose part and Figure 5a is a cross-section of the same;

Figures 6 - 8 are alternative cross-sections;

10       Figure 9 is a lengthwise section of yet another alternative hose part with the hose under pressure, and Figures 9a - 9c are alternative cross-sections of the same under pressure, whereas Figures 9d and 9e are cross-sections of the hose part in a state of rest with no pressure;

15       Figure 10 is a view of the connection point of the nozzle part and the hose part in one embodiment;

Figure 11 is a lengthwise section of one alternative of the nozzle part and Figures 11a and 11b are cross-sections under pressure and at rest; and

20       Figure 12 is a lengthwise section of another alternative nozzle part and Figure 12a is a cross-section of the same.

25       The filter means comprises a flexible hose 1 provided at its one end with a rapid connector 2 and at the other end with a shower nozzle 3. The shower nozzle is attached to the hose with a rapid connector 2'. With the rapid connector 2 the hose can be attached to the outlet part of a water tap 4.

30       A filter means 5 is located inside the hose. The filter means may have active carbon granules 7 fitted in between two porous layers 6, for example, fabric. The filter means can be formed by turning the strip formed by the fabric and the filter mass into spiral form into one or several layers. By means of stitches 8 (Figure 8), the space between the fabric layers is divided into several compartments, so that the carbon granules are kept in place.

35       The filter means forms a space open at its one end and closed at its other end. Its shape may be slightly conical (Figure 2), narrowing step by step (Figure 3) or with walls straight in the lengthwise direction, for example, cylindrical (Figure 4). An advantage with a conical filter is that the

pressure loss is as small as possible. In addition, the water flows evenly on the filter means surface.

5 The filter means may also in its middle part have one or several perforated and flexible tubes as inlet tubes and at the periphery several perforated and flexible tubes as outlet tubes (Figures 5 and 5a).

Water is conducted into the filter means 5 through its open end. While flowing towards the closed point of the filter means, water is filtered radially outwards through the filter.

10 The hose 1 may have a cylindrical cross-section or some other shape, for example, a polygon (Figure 6). When using a cylindrical filter, the hose may have a spiral expansion 9, whereby a spiral flow channel is formed for the filtered water between the filter and the hose (Figures 4 and 4a).

15 Water may alternatively be conducted into the hose from the opposite end outside the filter means (Figure 2, fully drawn thick arrows). Hereby filtration takes place from outside the filter means into it.

When required, annular parts 10 provided with protrusions may be used on the internal hose walls (Figure 7) to center the filter device in relation to the hose.

20 Figures 9 - 9e show an alternative to the filter. The filter is formed by two planar parts 11 which are fitted opposite to one another and are rigid in the transverse direction and flexible in the lengthwise direction. These are fitted inside the hose 1 so that a space is left between them, which narrows towards the tail end of the pressurized hose, and they are attached tightly to the hose at their sides. In a state of rest, the filter parts are against each other (Figures 9d and 9e) and the hose can easily be rolled up. Some filter masses are of a type which is preferably kept moist. When in a state of rest, the outer tube contracts tightly against the filter surface (Figures 9e and 11b), and this also prevents moisture from evaporating from the mass. When under a pressure, the hose extends or stretches so that a space is formed between the filter parts 11 (Figures 9a - 9c).

35 The filter part can be flushed out by leading water into the hose from its one end and by turning the hose for backflushing. The flexible, removable filter part can be

5 washed by squeezing it like laundry by hand and by soaking it in a wash basin. A fixing thread or emptying hose 13 may be mounted to the tail end of the filter part for bigger dirt particles gathering in the centre (Figure 10). When required, the whole filter part may also be replaced as a disposable part.

10 The filter part may be fitted into a shower nozzle (Figures 11 and 12) instead of or besides the hose. In this case, the handle part 12 of the shower nozzle can be made of flexible hose which will collapse in a state of rest. The filter part may be formed by only one plate-like part, which is preferably attached to the shower nozzle obliquely to the lengthwise direction. Such a filter part may be rigid in the transverse direction.

15 The solution shown in Figures 9 - 9e may also be formed by using only one filter part 11, which is rigid in the transverse direction.

20 The cross-section not only of the hose itself but also of the filter part both in the hose part and in the shower nozzle may vary in many different ways.

In addition, the filter may be provided with a cartridge containing a disinfectant and mounted in the hose, for example, with a screw mounting.

25 Instead of active carbon, the filter may also contain sand, siliceous earth or some other dense mass between the net fabric, or the filter may be formed by only a microfilter, a thin and dense membrane.

Claims

1. A filter means comprising a water line and a filter member (5) fitted into a housing (3 or 1) and forming alone or together with the housing (3 or 1) an elongated space which is open at its one end and closed at its other end and into which water is conducted through its open end, characterized in that the filter member is fitted into a shower fixture formed by a hose (1) and a shower nozzle (3).
2. A filter means as defined in claim 1, characterized in that the filter member (5) is fitted into a flexible part of the shower fixture and can be bent together with this.
3. A filter means as defined in claim 2, characterized in that the filter member (5) is fitted into a flexible hose.
4. A filter means as defined in claim 1, characterized in that the filter member (5) is fitted into a flexible handle part of a shower nozzle (3).
5. A filter means as defined in any claim 2 - 4, characterized in that the water outlet in the flexible part surrounding the filter member (5) is located at the end opposite to the inlet.
6. A filter means as defined in any claim 1 - 5, characterized in that the filter member (5) is fitted so that the flow cross-section on the inlet side of the filter device becomes smaller in the direction of flow.
7. A filter means as defined in claim 2, characterized in that the inner wall of the flexible hose (1) has one or several expansions (9) forming a flow channel outside the filter member (5).
8. A filter means as defined in claim 7, characterized in that the expansion (9) is spiral.
9. A filter means as defined in claim 2, characterized in that the filter member is formed of at least one filter part (11), which is rigid in the transverse direction and flexible in the lengthwise direction.
10. A filter means as defined in any claim 1 - 9, characterized in that the shower nozzle (3) is mounted removably or fixedly to one end of the hose (1).
11. A filter means as defined in any claim 1 - 10, characterized in that the hose (1) is provided with a rapid



connector (2) for mounting it to the outlet of a water tap (4).

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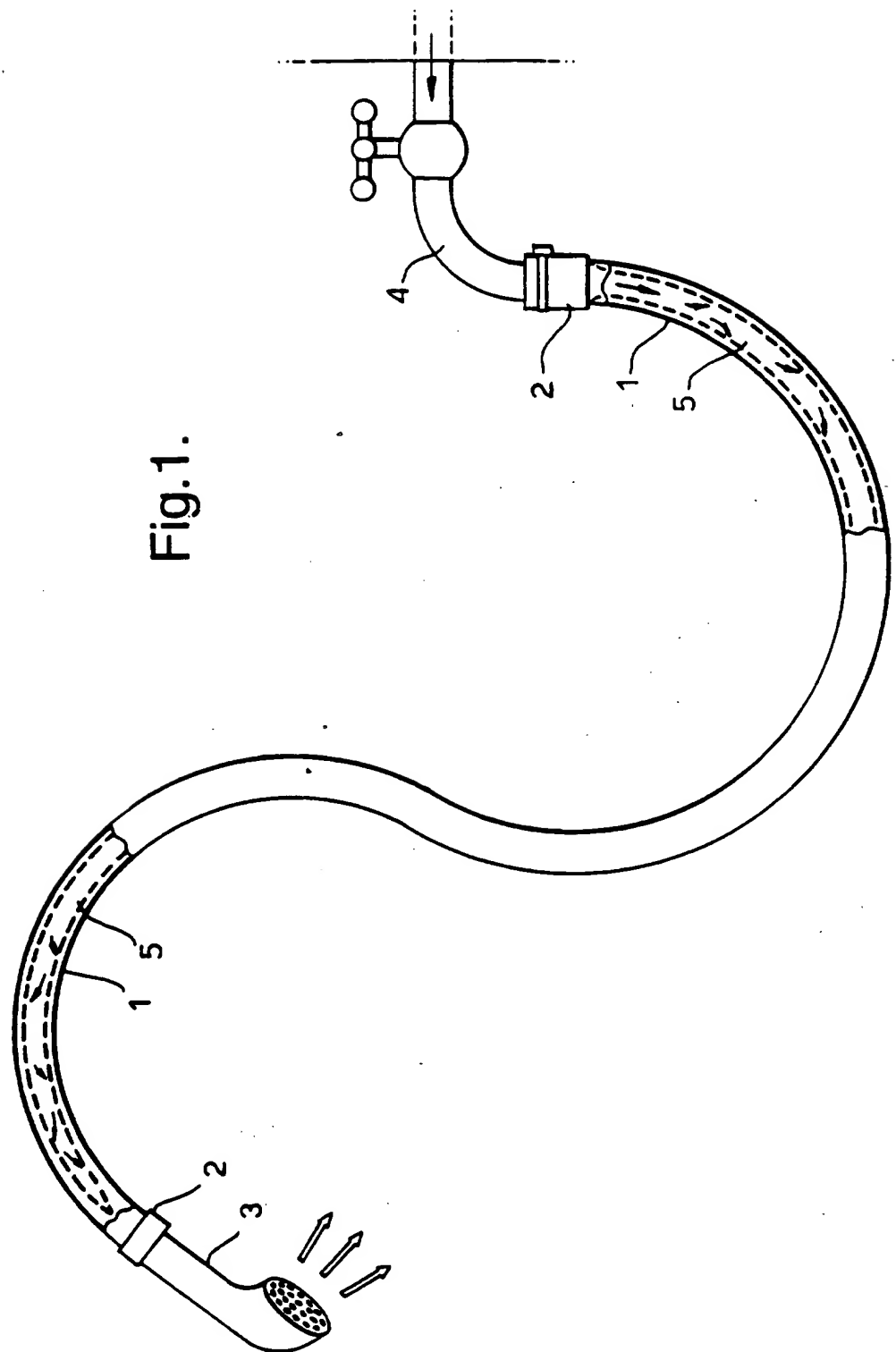


Fig.1.

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Fig.2.

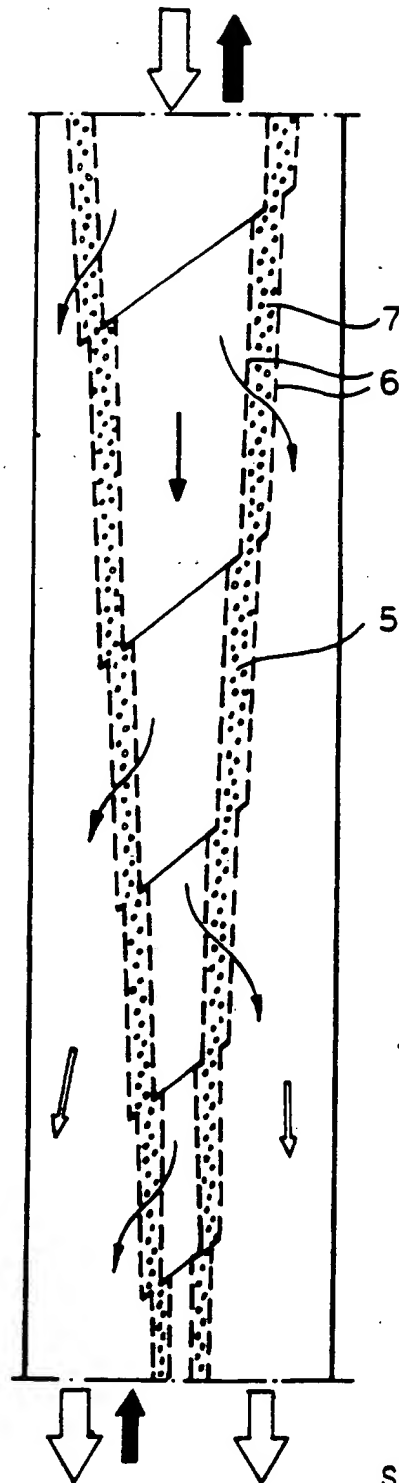
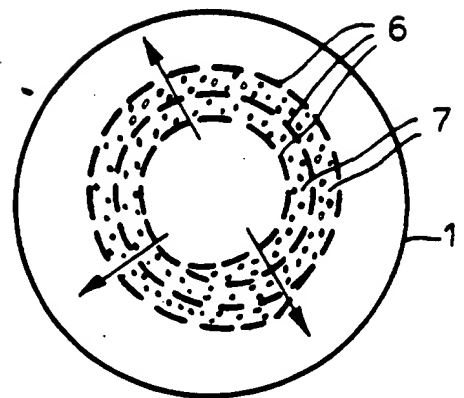
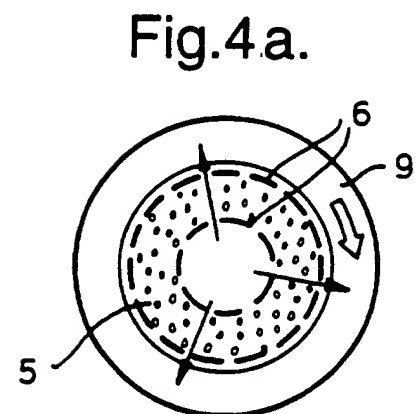
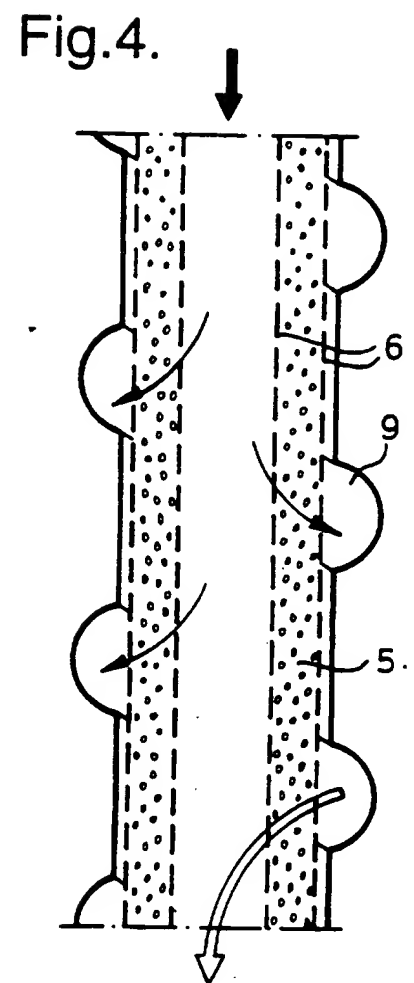
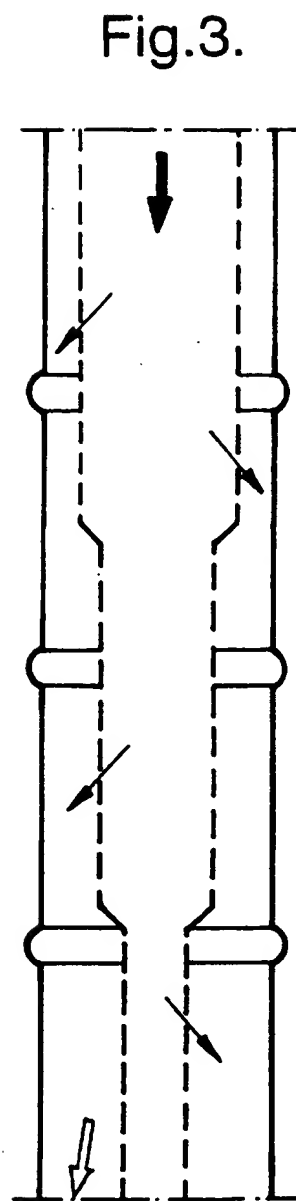


Fig.2a.



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Fig.5.

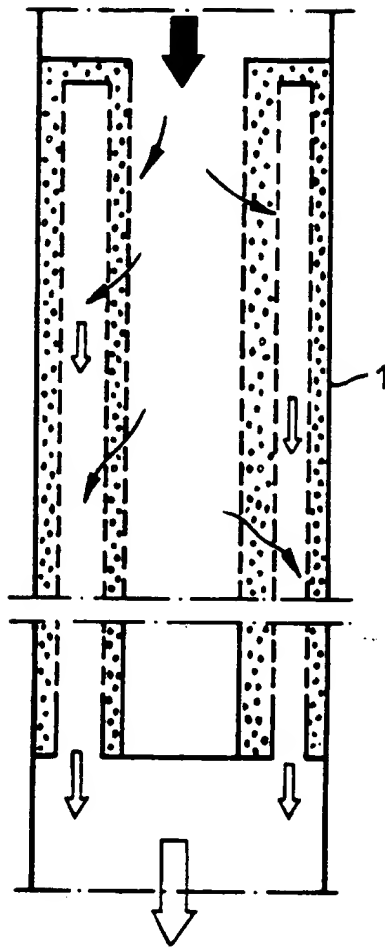


Fig.6.

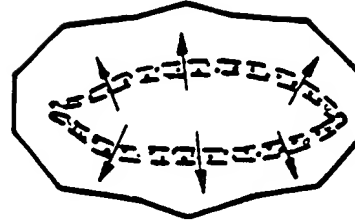


Fig.7.

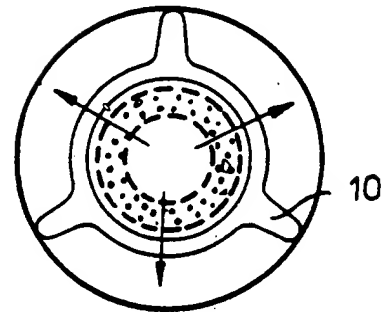


Fig.5a.

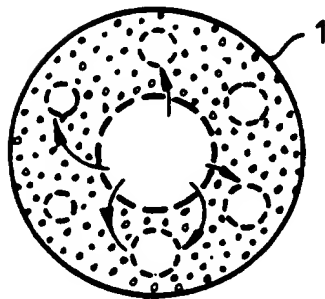
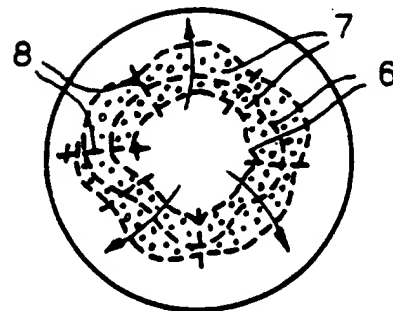


Fig.8.



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Fig.9.

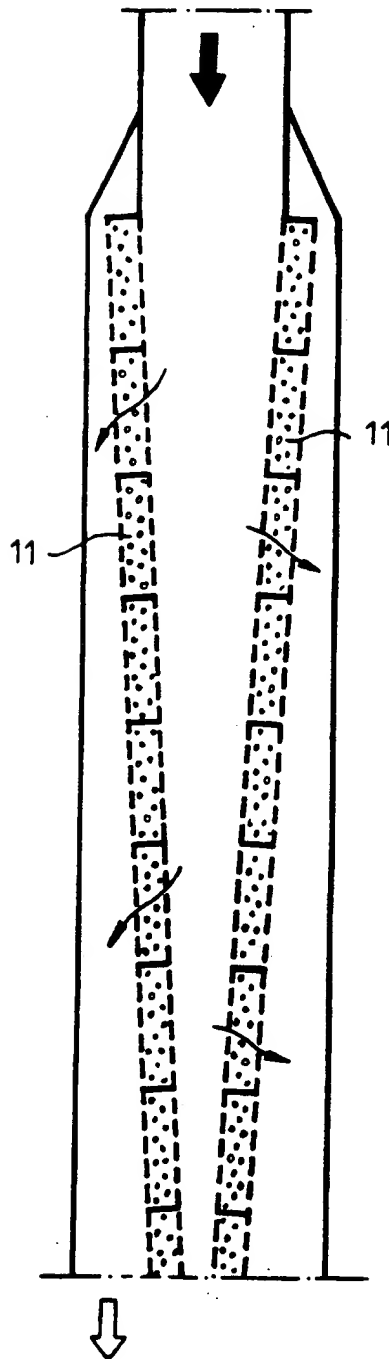


Fig.9a.

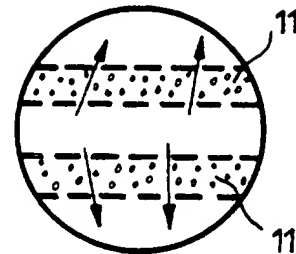


Fig.9 b.

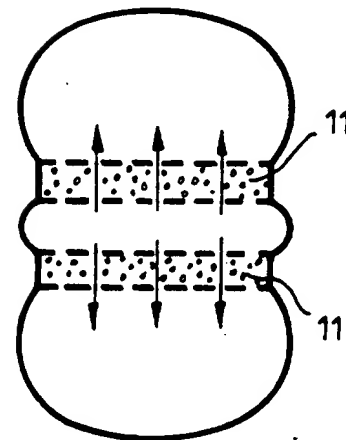
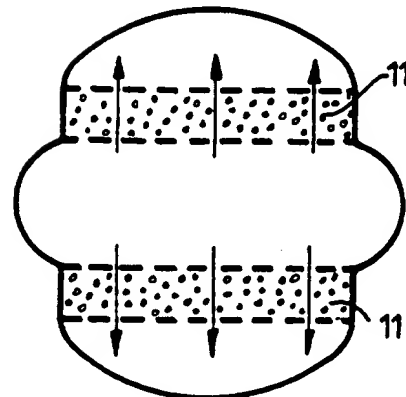


Fig.9c.



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Fig.9d.

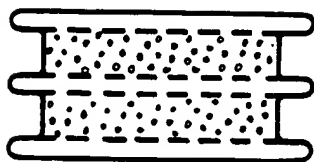


Fig.9e.

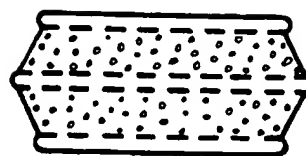
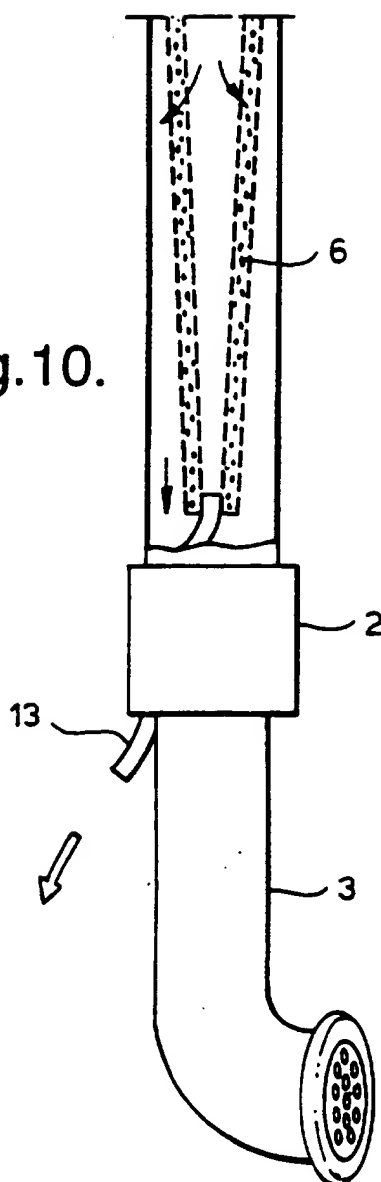


Fig.10.



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Fig.11.

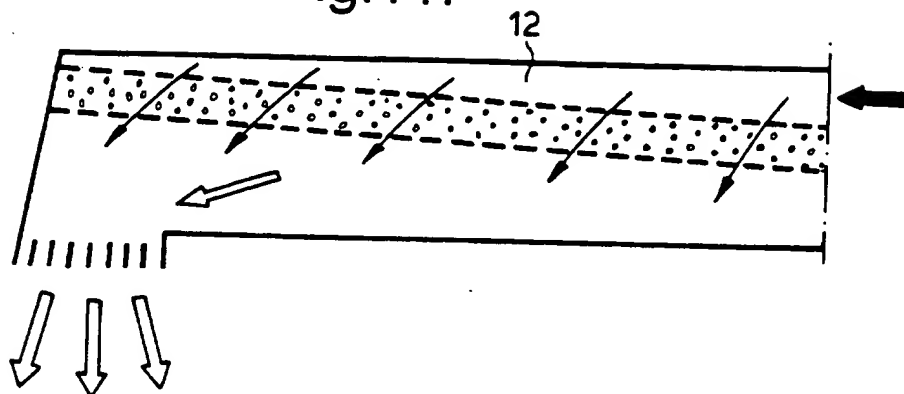


Fig.12.

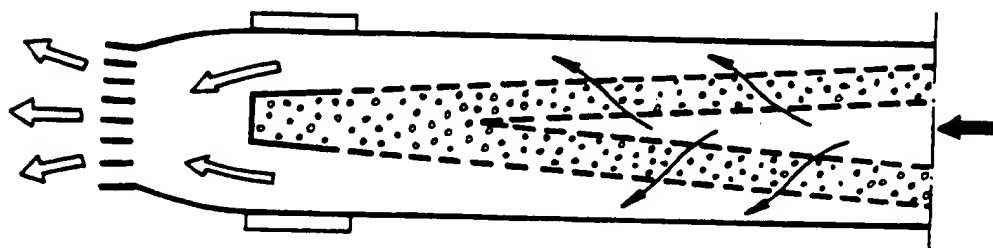


Fig.11a.

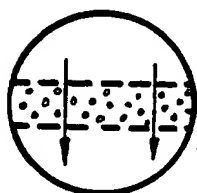


Fig.11b.

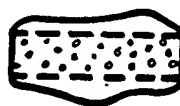
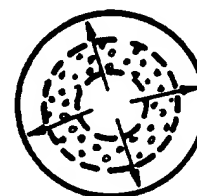


Fig.12a.



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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 96/00063

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B01D 35/02 // A47K 3/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A47K, B01D, E03C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG: WPI, CLAIMS

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4895651 A (GLEN H. MIDDLETON), 23 January 1990 (23.01.90), figure 2, abstract  -- -----	1-11

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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Date of mailing of the international search report

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